



Department of Transportation
Federal Aviation Administration
Office of Airworthiness
Washington, D.C.

TSO-C3d

Date 6/14/89

Technical Standard Order

Subject: TSO-C3d, TURN AND SLIP INSTRUMENT

(a) Applicability.

(1) Minimum Performance Standard. This technical standard order (TSO) prescribes the minimum performance standard that turn and slip instruments must meet in order to be identified with the applicable TSO marking. New models of turn and slip instruments, that are to be so identified and that are manufactured on or after the date of this TSO must meet the standards set forth in the Society of Automotive Engineers, Inc., (SAE) Aerospace Standard (AS) 8004, "Minimum Performance Standard for Turn and Slip Instrument", dated September 1975, as amended and supplemented by this TSO.

(2) Environmental Standard. The conditions and procedures prescribed in Radio Technical Commission for Aeronautics (RTCA) Document No. DO-160B, "Environmental Conditions and Test Procedures for Airborne Equipment," dated July 1984.

(3) Computer Software. If the equipment design implementation includes a digital computer, the computer software must be verified and validated in an acceptable manner. One acceptable means of compliance for the verification and validation of the computer software is outlined in RTCA Document No. DO-178A, "Software Considerations in Airborne Systems and Equipment Certification," dated March 1985. For those applicants who elect to use RTCA Document No. DO-178A to demonstrate compliance for the verification and validation of the computer software, the following requirements must be met:

(i) RTCA Document DO-178A defines three levels of software: Level 1, Level 2, and Level 3. The applicant must declare the level (or levels) to which the computer software has been verified and validated. This equipment may incorporate more than one software level. The software for flight navigation functions must be verified and validated to at least Level 2.

(ii) The applicant must submit a software verification and validation plan for review and approval.

DISTRIBUTION: ZVS-326;A-W(IR)-3;A-X(CD)-4;A-FFS-1,2,7,8(LTD);A-X(FS)-3;
AVN-1(2 cys);A-FAC-0(MAX)

NOTE: The Federal Aviation Administration (FAA) strongly recommends early discussion and agreement between the applicant and the FAA on the applicant's proposed software verification and validation plan, and the applicant's proposed software level or levels.

(b) Marking. In addition to the marking specified in Federal Aviation Regulations (FAR) section 21.607(d), the following information shall be legibly and permanently marked on the major equipment components:

(1) Each separate component of equipment that is manufactured under this TSO (antenna, receiver, transmitter, etc.) must be permanently and legibly marked with at least the name of the manufacturer and the TSO number.

(2) With regard to FAR section 21.607(d)(2), the part number is to include hardware and software identification, or a separate part number may be utilized for hardware and software. Either approach must include a means for showing the modification status.

(3) The level or levels to which the computer software has been verified and validated.

(4) Instrument type (I, II, or III).

(c) Data Requirements.

(1) In addition to FAR section 21.605, the manufacturer must furnish the Manager, Aircraft Certification Office (ACO), Federal Aviation Administration, having purview of the manufacturer's facilities, one copy each of the following technical data:

(i) Operating instructions.

(ii) Equipment limitations.

(iii) Installation procedures and limitations.

(iv) Schematic drawings as applicable to the installation procedures.

(v) Wiring diagrams as applicable to the installation procedures.

(vi) Specifications.

(vii) List of the major components (by part number) that make up the equipment system complying with the standards prescribed in this TSO.

(viii) An environmental qualification form as described in RTCA Document DO-160B.

(ix) Manufacturer's TSO qualification test report.

(x) Nameplate drawing.

(xi) The appropriate documentation as defined in RTCA/DO-178A, or equivalent, necessary to support the verification and validation of the computer software to Level 1, Level 2, and Level 3. If the software is verified and validate to more than one level, the appropriate documentation for each level of software must be submitted.

(2) In addition to those data requirements that are to be furnished directly to the FAA, each manufacturer must have available for review by the Manager, ACO having purview of the manufacturer's facilities, the following technical data:

(i) A drawing list, enumerating all of the drawings and processes that are necessary to define the article's design.

(ii) The functional test specification to be used to test each production article to ensure compliance with this TSO.

(iii) Equipment calibration procedures.

(iv) Corrective maintenance procedures (within 12 months after TSO authorization).

(v) Schematic drawings.

(vi) Wiring diagrams.

(vii) The appropriate documentation as defined in RTCA/DO-178A, or equivalent, necessary to support the verification and validation of the computer software to Level 1, Level 2, and Level 3. If the software is verified and validated to more than one level, the appropriate documentation for each level of software must be available for review.

(viii) The results of the environmental qualification tests conducted in accordance with RTCA DO-160B.

(d) Data to be furnished with manufactured units. One copy of the data and information specified in paragraphs (c)(1)(i) through (viii) of this TSO, and instructions for periodic maintenance and calibration which are necessary for continued airworthiness must go to each person receiving for use one or more articles manufactured under this TSO.

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(e) Availability of Reference Documents.

(1) Copies of SAE AS 8004 may be purchased from the Society of Automotive Engineers Inc., Department 331, 400 Commonwealth Drive, Warrendale, Pennsylvania 15096.

(2) Copies of RTCA Documents No. DO-160B and DO-178A may be purchased from the Radio Technical Commission for Aeronautics Secretariat, One McPherson Square, Suite 500, 1425 K Street, NW., Washington, DC 20005.

(3) Federal Aviation Regulations Part 21, Subpart O, and Advisory Circular 20-110E, "Index of Aviation Technical Standard Orders, may be reviewed at the FAA Headquarters in the Aircraft Certification Service, Aircraft Engineering Division (AIR-120), and at all regional ACO's.



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